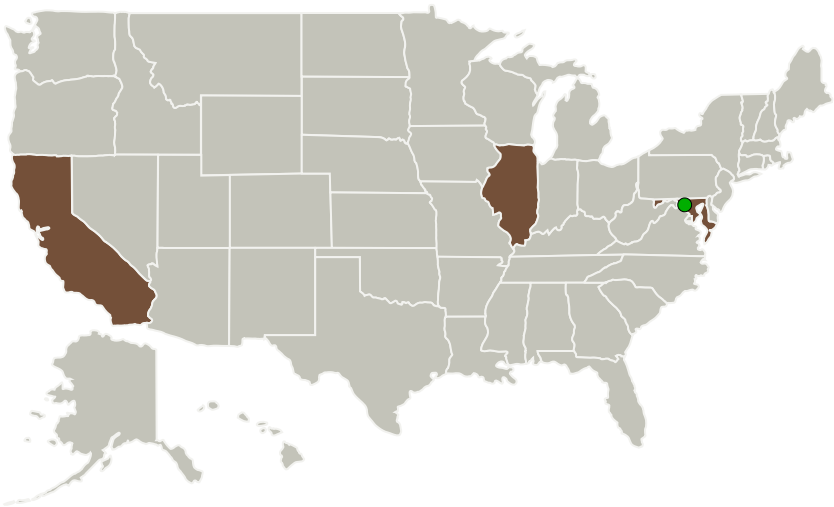
Infrared Microspectrometer based on MEOMS Lamellar Grating Interferometer, Phase I

Completed Technology Project (2012 - 2013)

Project Introduction

Infrared spectroscopy is an invaluable detection and measurement tool intensively used in Earth Science, Solar Physics and Astrophysics experiments pursued from satellite platforms. The geometrical characteristics and sensitivity of satellite infrared spectroscopy systems is often determined or limited by their optical elements. Improvements in optical components allow one to reduce the mass and increase the sensitivity of the system. Here we propose a compact, high sensitivity sensor based on the integration of HgCdTe photodiode detection technology with micro-opto-electromechanical-systems (MOEMS) technology. This combines HgCdTe's high sensitivity with an inexpensive MOEMS lamellar grating interferometer (LGI) device. During Phase I we will perform the optical and mechanical design of the lamellar grating elements, identify suitable processes for fabrication, demonstrate etch processes compatible with the LGI design, and demonstrate prototype lamellar elements. During Phase II, we will further optimize the LGI components, minimize their size, weight and power, and integrate them into an operational LGI. A prototype LGI instrument will be deployed in an environment with controlled input of a variety of low-level test gases. We will develop and test detection-identification algorithms and build a characterization set-up to assess the LGI's sensitivity, selectivity and probability of detection.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
EPIR Technologies, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Bolingbrook, Illinois
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
University of California-Santa Cruz	Supporting Organization	Academia	Santa Cruz, California

Primary U.S. Work Locations	
California	Illinois
Maryland	

Project Transitions

February 2012: Project Start

February 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138652)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

EPIR Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

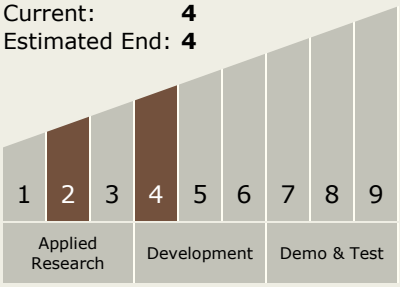
Carlos Torrez

Principal Investigator:

Silviu Velicu

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System